Designing a drawing-based tool to manage EBRT process in an open-source oncology EMR system

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Problem

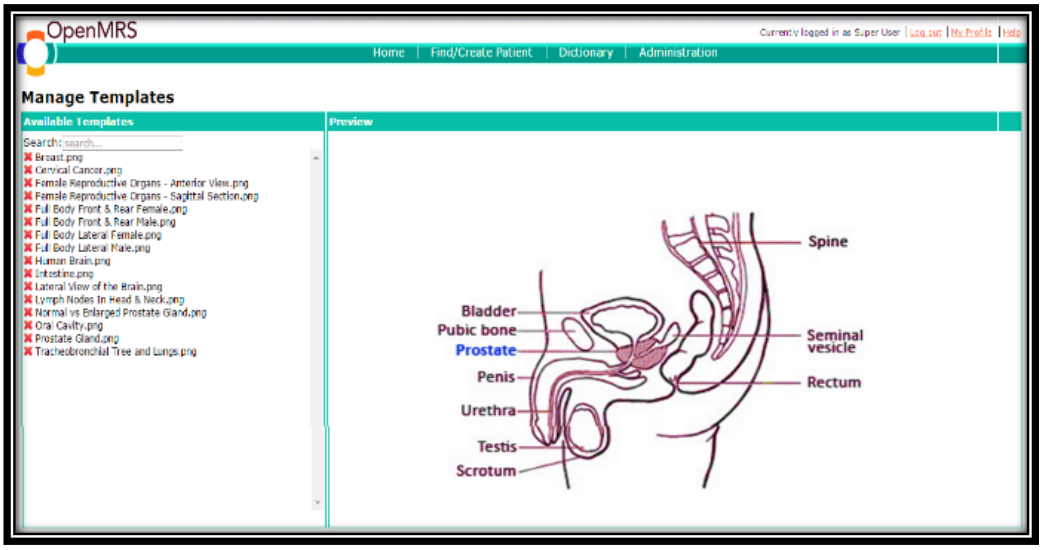
External beam radiotherapy (EBRT) is a complex treatment process that requires appropriate communication and planning between the oncologist, interventional radiologist and the radiology technician. Hand drawn images or annotations on radiology images are often used for communication. Cone beams, angles, treatment ports, dose distribution curves are in a state of constant flux particularly when used in conjunction with modern image-guided (CT or X-ray) radiation therapy. Treatment procedure needs to be well articulated and communicated by electronic means and remains a challenge in general-purpose EMR systems.

Purpose

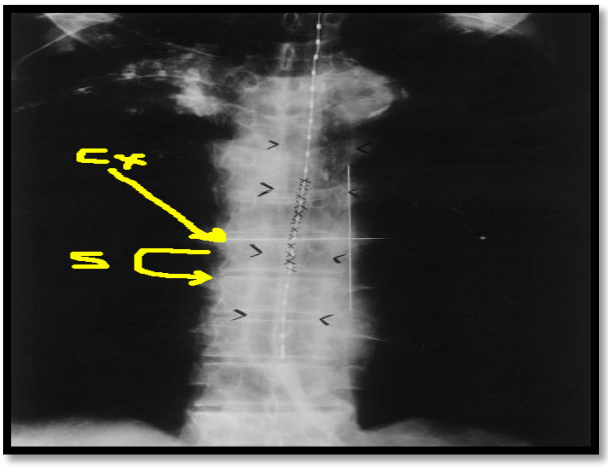
This poster showcases our community-based participatory research to implement an EMR system to manage care provided in oncology clinics by integrating the workflow of radiation practices. The goal of our research is to explore the challenges and opportunities of using open-source tools to support an oncology clinic in a large teaching hospital, particularly in their radiation therapy process. Based on the user needs, we designed and developed a drawing module that would facilitate better communication and reduce errors.

Methods

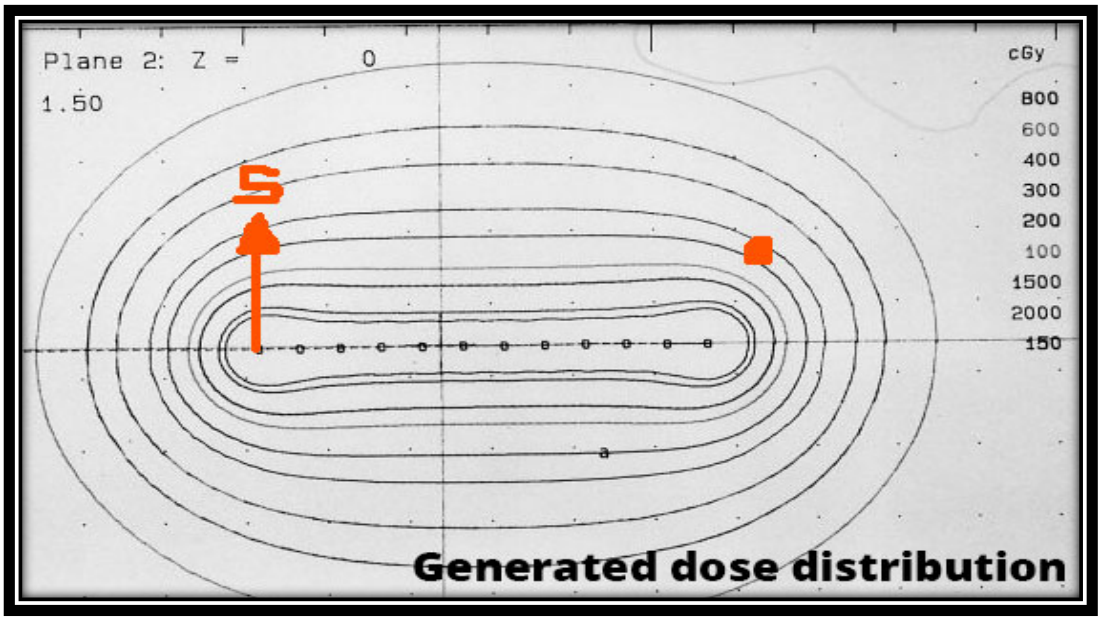
We implemented the oncology terminology in the OpenMRS, the open-source EMR system. The global community of informaticians participated in customizing a dictionary that was suitable for oncology practices. We then involved interventional radiologists to further customize to add granular terms that are used in their practice. We observed the practice of hand-drawings, and the use of markers on X-rays that is used by radiology oncologists and technicians to communicate.



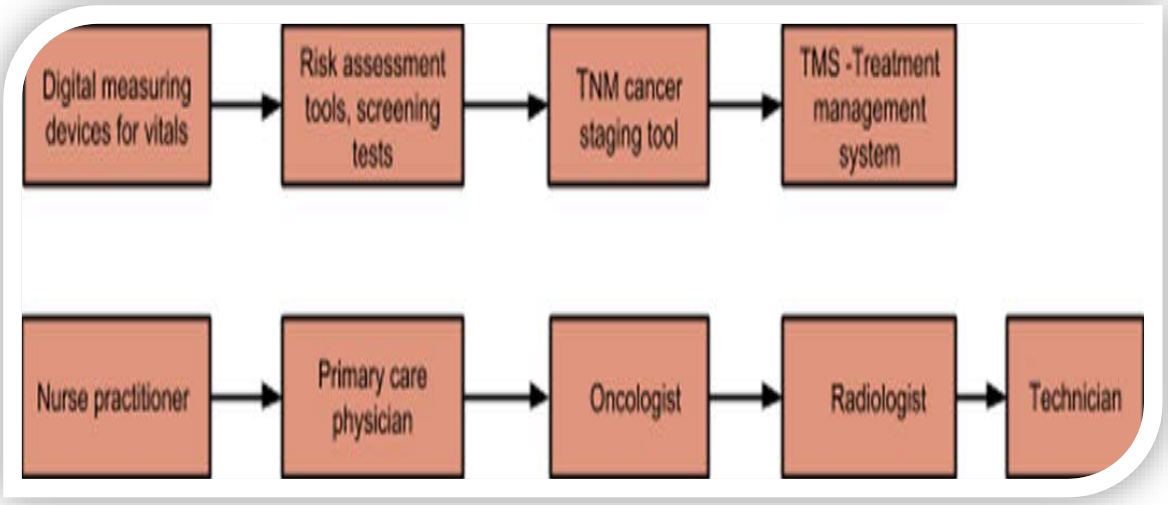
The drawing module was created by a Google summer of code intern to allow adding images and add pen-based input on these images. The images came from a PACS or RIS system into the EHR, with ability to make annotations and drawings on the images. These CT/X-ray images are also updated in a real-time basis on which the oncologist or radiologist can make changes that are reflected on the technician's screen as shown below:



The EMR system can also generate dose distribution curve based on a set of values that are entered by the oncologist. Over the next few weeks of treatment, based on the images that are



recorded in the PACS, we also implemented a feature where dose distribution curves that can be adjusted by the oncologist in the drawing module and gets reflected on the technicians screen.



Preliminary results

Opportunities – The open-source community allowed the development of a quick terminology dictionary for oncology practice. The network of informaticians provided suggestions for the creation of forms to generate the dose distribution curves. The development of the drawing module was done by the support of Google for open-source projects. Students participated in the community and developed tools that can be used by any implementation around the world.

Challenges – The limited capabilities of integrating OpenMRS with EBRT devices hampers direct management. Technicians are skilled users of EBRT devices, but not experienced in the use of EMRs. Device integration remains a challenge unless access to device APIs is available to developers of EMR systems.